Section 4 – Emission Estimates

4.0 Potential to Emit/Emission Estimates/Limitation on Potential to Emit

4.1 Emission Estimates

Emission estimates are summarized in Table 4-1. Emission rates were based on a maximum throughput of raw milk of 3 million pounds per day. Specific discussion regarding potential to emit for each source is presented in the following sections.

4.1.1 MPC/Skim Milk and Permeate Drying

Particulate matter (PM10) emission rates for the MPC/Skim Milk Dryer (P101) and Permeate Dryer (P103) were calculated based on information provided by the supplier, C/E/Rogers for powder handling emissions and for natural gas combustion emissions from an EPA AP-42 emission factor. Emission factors for carbon monoxide (CO) and nitrogen oxides (NO_x) were calculated based on an emission concentration guarantee from Maxon Corporation, the manufacturer of the burners used to provide heat for the dryers. Emission factors for sulfur dioxide (SO_2), volatile organic compounds (VOC), and toxic air pollutant emission rates were based on EPA AP-42, Chapter 1.4 "Natural Gas Combustion". Calculated emission rates for the dryer are included in Appendix 1.

4.1.2 Fluid-beds

Particulate emissions from the MPC/Skim Milk Fluid-Bed (P102) and the Permeate Fluid-Bed (P104) were calculated based on information provided by the supplier, C/E/Rogers. The particulate capture efficiency of the baghouse following each fluid-bed was considered when calculating the emission rate from these process units. Calculated emission rates for the fluid-beds are included in Appendix 1.

4.1.3 Permeate Powder Receiver

Particulate emissions from the Permeate Powder Receiver (P105) were calculated based on information provided by the supplier, C/E/Rogers. The particulate capture efficiency of the baghouse was considered when calculating the emission rate from this process unit. Calculated emission rates for the permeate powder receiver operations are included in Appendix 1.

4.1.4 Boilers

Emissions from the Boilers (P106 and P107) were estimated using AP-42 emission factors (AP-42, Chapter 1.4 "Natural Gas Combustion"). The two boilers will only combust natural gas. Since the boilers are fully redundant, emission calculations assumed only one boiler will be in operation at any one time. Emission calculations are included in Appendix 1.

4.1.5 Emergency Generator

Emission factors provided by the emergency generator (P108) equipment manufacturer (Cummins) were used for calculation of PM, SOx, CO, and NOx emission rates. The vendor supplied emission factors were provided for a variety of loading conditions, for purposes of this permit application the worst case emission factor was utilized. Emission factors from AP-42 emission factors (Chapter 3.4, "Large Stationary Diesel and All Stationary Duel-fuel Engines") were used to calculate emissions of TAPs. The total emission rates on a ton per year basis were calculated assuming 500 hours of operation. Emission calculations are included in Appendix 1.

Table 4-1
Summary of Potential Emission Rates

Emission Inventory
Idaho Milk Products
Jerome, Idaho

Pollutant	MPC/Skim Dryer P101A & P101B		MPC/Skim Fluid-Bed P102		Permeate Dryer P103		Permeate Fluid-Bed P104		Permeate Powder Receiver baghouse P105		Boilers P106 & P107		Emergency Generator[(a)] P108		Total	EL	Total
	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(lb/hr)	(ton/yr)
PM_{10}	7.896	34.6	0.78	3.4	7.01	30.68	1.97	8.6	0.047	0.20	0.25	1.1	0.62	0.2	18.6		78.7
SO_2	0.024	0.1			0.007	0.0					0.02	0.1	0.36	0.1	0.4		0.3
NO_x	1.6	6.8			0.5	2.0					3.28	14.4	0.97	4.3	6.3		27.5
CO	12.4	54.3			3.7	16.3					2.76	12.1	2.2	0.5	21.0		83.2
VOC	0.22	0.9			0.06	0.3					0.18	0.8			0.5		2.0
Lead	2.0E-05	8.6E-05			5.9E-06	2.6E-05					1.6E-05	7.2E-05			4.2E-05		1.8E-04
Acetaldehyde													2.3E-04	5.8E-05	1.3E-05	3.0E-03	5.8E-05
Acrolein													7.3E-05	1.8E-05	7.3E-05	1.7E-02	1.8E-05
Arsenic	7.8E-06	3.0E-05			2.4E-06	9.0E-06					6.6E-06	2.5E-05			1.7E-05	1.5E-06	6.4E-05
Benzene	6.7E-05	2.6E-04			6.7E-05	2.6E-04					1.3E-04	5.0E-04	7.2E-03	1.8E-03	6.7E-04	8.0E-04	2.8E-03
Benzo(a)pyrene	3.8E-08	1.5E-07			3.8E-08	1.5E-07					7.4E-08	2.8E-07	2.4E-06	5.9E-07	2.9E-07	2.0E-06	1.2E-06
Cadmium	4.3E-05	1.7E-04			1.3E-05	5.0E-05					3.6E-05	1.4E-04			9.2E-05	3.7E-06	3.5E-04
Fluorene	8.9E-08	3.4E-07			8.9E-08	3.4E-07					1.7E-07	6.6E-07	1.2E-04	3.0E-05	1.2E-04	1.3E-01	3.1E-05
Formaldehyde	2.9E-03	1.1E-02			8.8E-04	3.4E-03					2.5E-03	9.4E-03	7.3E-04	1.8E-04	6.3E-03	5.1E-04	2.4E-02
Naphthalene	1.9E-05	7.4E-05			1.9E-05	7.4E-05					3.8E-05	1.4E-04	1.2E-03	3.0E-04	1.4E-04	3.3E+00	5.9E-04
Nickel	8.2E-05	3.2E-04			2.5E-05	9.5E-05					6.9E-05	2.6E-04			1.8E-04	2.7E-05	6.7E-04
Toluene	1.1E-04	4.2E-04			1.1E-04	4.2E-04					2.1E-04	8.0E-04	2.6E-03	6.5E-04	3.0E-03	2.5E+01	2.3E-03
Total PAH													2.0E-03	4.9E-04	1.1E-04	9.1E-05	4.9E-04
Xylenes													1.8E-03	4.5E-04	1.8E-03	2.9E+01	4.5E-04

Notes:
(a) The ton/yr emission rates from the generator for all pollutants were based on 500 hr/yr operation. The lb/hr emission rates from the generator were reduced by a ratio of 500 hr / 8760 hr for pollutants with only an annual average compliance limit (NOx and carcinogenic TAPs).

4.2 Process Weight Rule

The Process Weight Rule (IDAPA 58.01.01.700) applies to the milk processing operations at this plant. This rule limits the amount of particulate matter (PM) that can be discharged from a source. Appendix 1 includes an estimate of PM emissions from process equipment (excluding emissions from fuel combustion equipment) and summarizes the calculation of the allowable PM discharge according to the Process Weight Rule.

According to the Process Weight Rule analysis summarized in Appendix 1, the facility at its capacity of 3.0 million pounds per day of raw milk is allowed to discharge 20.68 pounds PM per hour from process equipment (excludes fuel burning equipment). The facility is only anticipated to generate 17.31 pounds PM per hour; therefore, the anticipated PM loading from the facility will meet requirements of the process weight rule.

4.3 Limitations on Potential to Emit

Emission calculations are based on the facility operating at the maximum milk processing rate of 3 million pounds per day. Membrane design specifications will provide a physical bottleneck that will limit milk processing to 3 million pounds per day. In addition, each component of the powder processing unit operations are physically limited based on C/E/Rogers basis of design. If necessary to accommodate IDEQ requirements, the facility is willing to accept the following process limits:

- Raw Milk = 3 million pounds per day
- MPC Powder = 5,976 lb/hr
- Skim Milk Powder = 13,491 lb/hr
- Permeate Powder = 9,096 lb/hr

The following limits are required for the facility:

- Operation and maintenance of baghouses (P101A and B, P102, P104, P105) and a scrubber (P103) to prevent excess emissions of particulate matter;
- Maximum total boiler (P106 and P107) natural gas combustion of 287.5 million scf/year; and
- Limit the emergency generator to 500 total hours per year of operation and 100 hours per year for maintenance purposes.

The facility is considered a synthetic minor source since it relies on limitations in operation and on physical controls to prevent exceedance of the major source classification.

Section 5 – Facility Classification

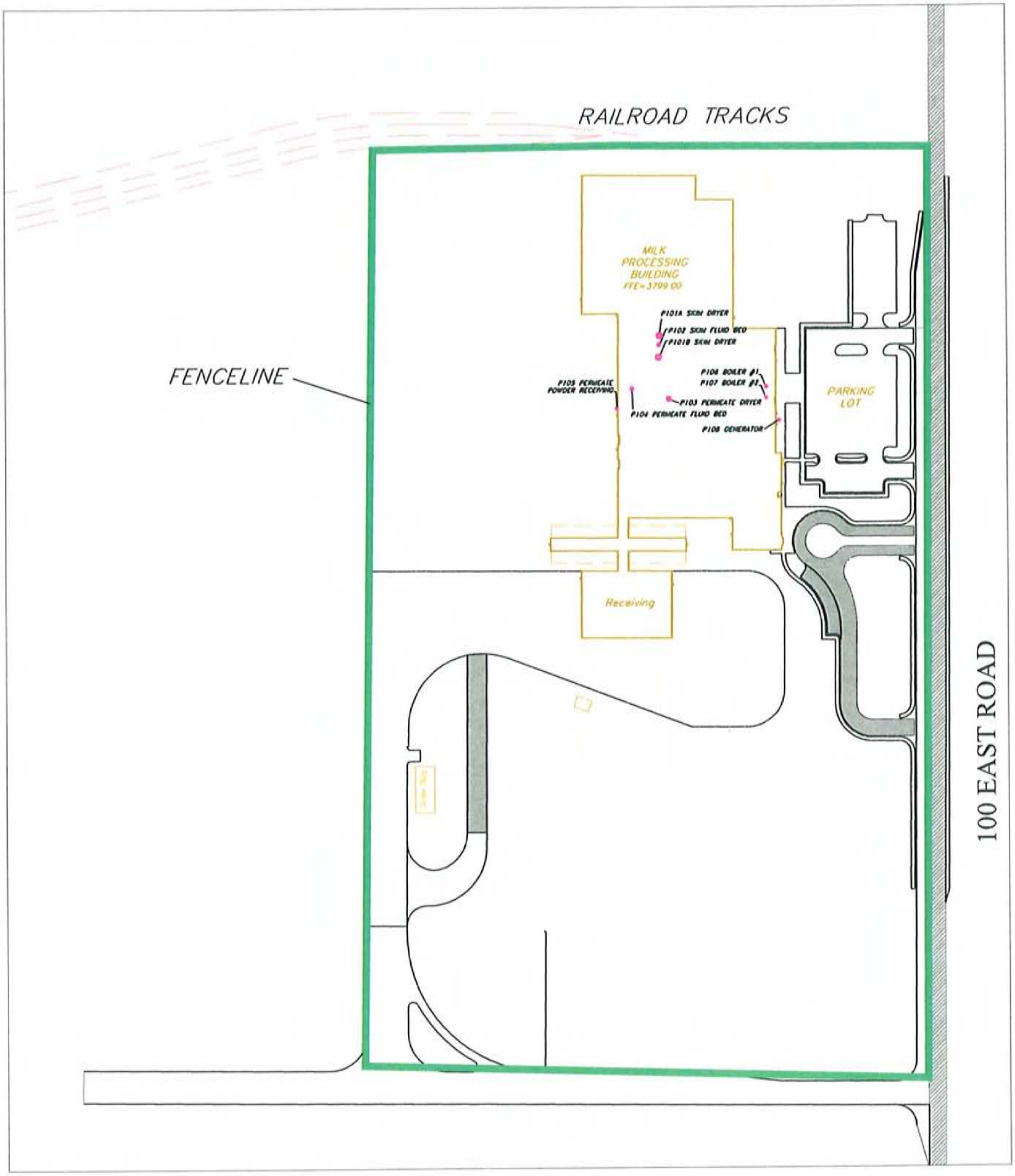
5.0 Facility Classification

The IMP Plant is to be located in Jerome, Idaho. This area is considered attainment or unclassified for all criteria pollutants.

The facility is not a designated facility as defined in IDAPA 58.01.01.006.26. The facility is not a major facility as defined IDAPA 58.01.01.008.10. The proposed modification is not a major modification defined in IDAPA 58.01.01.006.55. The primary SIC Code for the facility is 2023 and the NAICS code is 311514.

There are no Class I areas within 10 km of the facility. PSD is not applicable as discussed in Section 3. Emission inventories are presented in Section 4.

Section 6 - Plot Plan



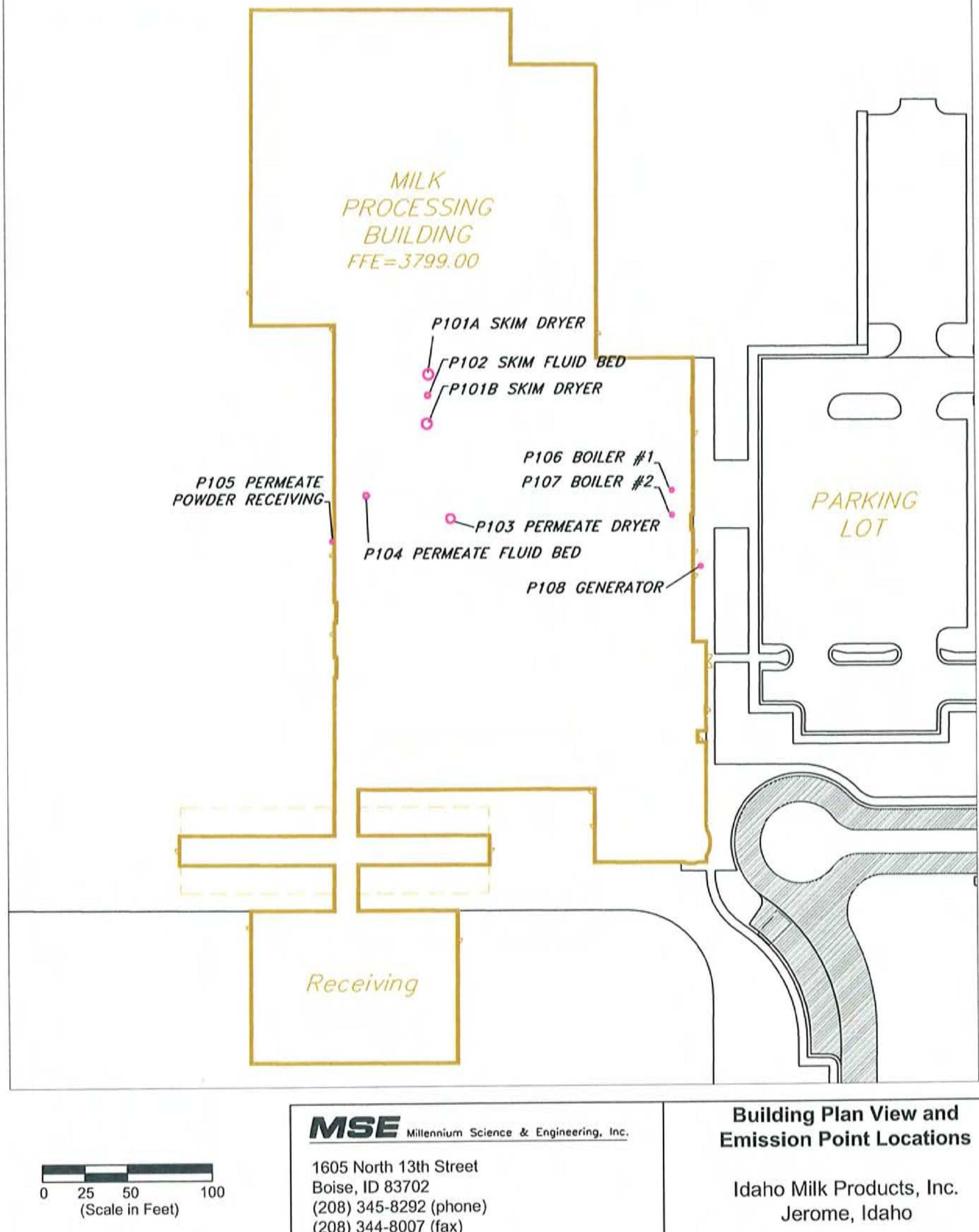
MSE Millennium Science & Engineering, Inc.

1605 North 13th Street
Boise, ID 83702
(208) 345-8292 (phone)
(208) 344-8007 (fax)

Site Map with Fenceline Location

Idaho Milk Products, Inc.
Jerome, Idaho

10-22-07	Figure 3



MSE Millennium Science & Engineering, Inc.

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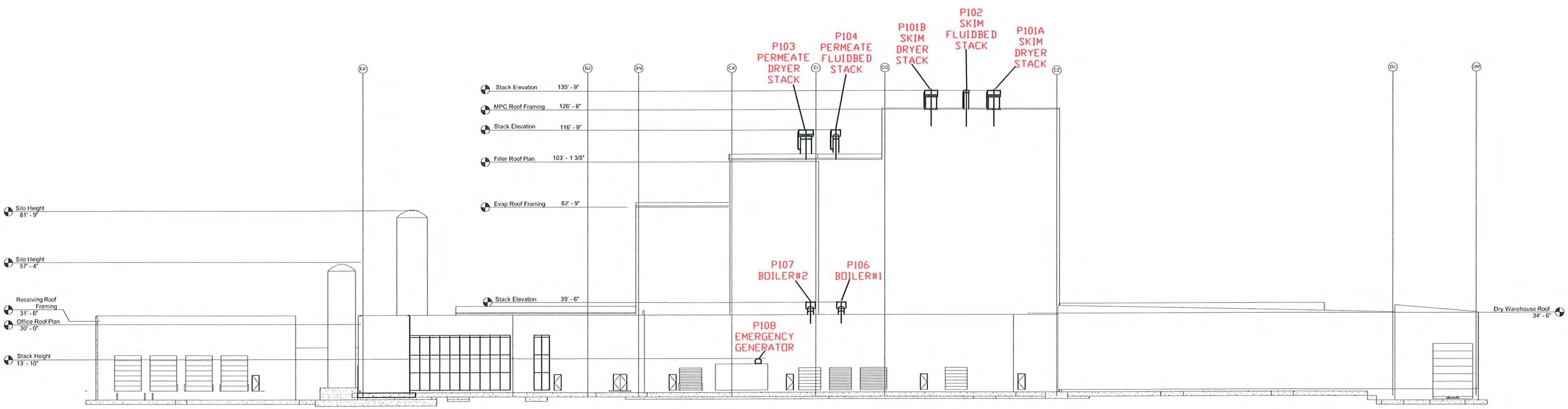
Building Plan View and Emission Point Locations

Idaho Milk Products, Inc.
Jerome, Idaho

10-22-07	Figure 4



MSE Millennium Science & Engineering, Inc. 1605 North 13th Street Boise, ID 83702 (208) 345-8292 (phone) (208) 344-8007 (fax)	**East Elevation View** Idaho Milk Products, Inc. Jerome, Idaho	
	10-22-07	Figure 5

Section 7 – Ambient Impact Assessment

7.0 Ambient Impact Assessment

Air dispersion modeling was performed to demonstrate compliance with NAAQS for criteria pollutants and Idaho Department of Environmental Quality (IDEQ) screening levels for TAPs in support of this Pre-Permit Construction and PTC Application for the IMP facility. Modeling was performed according to the Modeling Protocol submitted to the IDEQ on October 5, 2007 (see Appendix 3 for a copy of the modeling protocol and the IDEQ approval letter).

7.1 Model Description / Justification

Air dispersion modeling was performed using the Environmental Protection Agency (EPA) AERMOD model (version 07026). Building downwash was accounted for in the model. Building and tank dimensions were entered into the Building Parameter Input Program to calculate appropriate building profiles to import into AERMOD. Model output printouts are included in Appendix 4 and input/output files are included as electronic files on an enclosed compact disc.

7.2 Emission and Source Data

Nine point sources were modeled. The nine point sources included discharges from five baghouses, one dryer scrubber, two boilers, and one emergency generator. Three criteria pollutants (PM_{10}, NOx, and CO) were modeled from these sources (emission rates for SOx and lead were below the modeling thresholds listed in Table 1 of the State of Idaho Air Quality Modeling Guidelines). The estimated emission rates for the toxic air pollutants (TAPs): arsenic, cadmium, formaldehyde, and nickel that result from the combustion of natural gas in the dryer, emergency generator, and boilers exceeded the Emission Screening Limits (EL) and were therefore modeled. Although estimated emissions of PAHs exceeded the applicable EL, PAHs were not modeled because the emission factor used to estimate PAH emissions was a "less than value" and because the estimated emissions using this questionable emission factor only exceeded the EL by a small margin. Table 7-1 summarizes the emission source characteristics used in the ambient impact analysis. All modeling was performed using the maximum potential to emit.

The modeled emission rates for NOx and CO listed in Table 7-1 for sources P101 and P103 are higher than what is presented in Table 4-1 and in the emission calculation worksheets included in Appendix 1. The reason for this discrepancy is that after modeling was completed using the higher emission rates listed in Table 7-1, the emission calculations for these pollutants were revised and as a result the estimated emission rates were reduced. Since modeling completed at the higher emission rates demonstrated compliance, the original modeling was considered to be conservative and therefore modeling was not rerun.

Modeling was performed in two passes, in the first pass we assumed 100% of the MPC/Skim Milk Dryer emissions discharged through each baghouse stack. We found this scenario passed for all pollutants except PM_{10}. We reran the model for PM_{10} with one of the two stacks not emitting from the P101 MPC/Skim Milk Dryer (i.e. P101A emitting full emission rate while P101B not emitting and vice versa). This scenario passed. For conservatism, and to save time, we did not rerun the model for the other pollutants with the emission rates split between the two stacks since the modeling worked at the higher rates.

All stack parameters and discharge characteristics used in modeling and listed in Table 7-1 are representative of actual conditions or based on conservative assumptions. The stack diameter and discharge height for all emission sources are actual values from design drawings provided by Big-D Construction, general contractor for this project. The two exceptions are the discharge diameters for the Permeate Powder Receiver Baghouse and Emergency Generator. The Permeate Powder Receiver Baghouse discharges horizontally; therefore, the discharge diameter was set to 0.001 meter. The Emergency Generator stack diameter was originally conservatively assumed to be 2.67 feet, recent information provided by the manufacturer indicates that the diameter is 10 inches. Since the larger diameter used in the modeling is more conservative, modeling was not updated to reflect the revised diameter. The discharge temperature was provided by C/E/Rogers as the actual design operating temperature for all sources except the boilers and emergency generator. The discharge temperatures for the boilers were conservatively estimated based on actual conditions observed at several operating boilers. The discharge temperature for the emergency generator was conservatively reduced from 873 °F (the specified manifold discharge temperature) to 500 °F to account for heat losses prior to discharge. The discharge flowrates for all sources except the boilers and emergency generator are actual design operating values provided by C/E/Rogers. The discharge flowrates for the boilers and emergency generator were calculated using EPA method 19 Fw factors. The wet standard flowrates calculated using the Fw factors were converted to actual conditions based on site specific temperature and pressure values. The manufacturer of the emergency generator has reported that the stack discharge flowrate is 15,385 cfm, since our assumption was more conservative, modeling was not revised.

Table 7-1
Emission Source Characteristics

Emission Source	Stack ID	Stack Height (ft)	Stack Diam. (ft)	Exhaust Temp. (°F)	Stack Gas Vel. (m/s)	Emission Rates (g/s)						
						PM_{10}	NOx	CO	As	Cd	Formald-ehyde	Ni
MPC/Skim Dryer Baghouse #1	P101A	135.75	5.75	190	12.42	0.995[3]	0.226[4]	1.877[4]	8.63E-7	4.89E-6	3.16E-4	9.21E-6
MPC/Skim Dryer Baghouse #2	P101B	135.75	5.75	190	12.42	0.995[3]	0.226[4]	1.877[4]	8.63E-7	4.89E-6	3.16E-4	9.21E-6
MPC/Skim Fluid-Bed Baghouse	P102	135.75	2.5	130	9.40	0.098	--	--	--	--	--	--
Permeate Dryer Scrubber	P103	116.75	6.5	112	8.03	0.883	0.076[4]	0.566[4]	2.59E-7	1.44E-6	9.78E-5	2.73E-6
Permeate Fluid-Bed Baghouse	P104	116.75	4.167	130	10.94	0.248	--	--	--	--	--	--
Permeate Powder Receiver Baghouse	P105	43.08	(1)	(1)	(1)	0.0059	--	--	--	--	--	--
Boiler#1	P106	39.5	4.083	350	4.03	0.0315	0.413	0.347	7.19E-7	4.03E-6	2.70E-4	7.48E-6
Boiler#2	P107	39.5	4.083	350	4.03	0.0315	0.413	0.347	7.19E-7	4.03E-6	2.70E-4	7.48E-6
Emergency Generator	P108	13.8	2.67 [2]	500 [2]	3.08[2]	0.0782	0.123	0.277	--	--	5.18E-6	--

Notes:

(1) Stack gas velocity set to 0.001 m/s and diameter set to 0.001 m due to the stack's horizontal discharge orientation. The exhaust temperature was assumed to be ambient (default to 0 K) for modeling purposes.

(2) The stack diameter was conservatively assumed to be 2.67ft, the actual diameter reported by the manufacturer is 10 inches. The discharge temperature for the generator exhaust was reduced from 873 °F to 500 °F to account for heat losses from the exhaust manifold to discharge elevation. The stack discharge flowrate was estimated based on EPA method 19 Fw factors, the actual flowrate reported by the manufacturer is 15,385 cfm.

(3) Modeling was performed in two passes, in the first pass we assumed 100% of the MPC/Skim Milk Dryer emissions discharged through each baghouse stack. We found this scenario passed for all pollutants except PM10. We reran the model for PM10 with one stack not emitting for dryer emissions (i.e. P101A emitting full emission rate while P101B not emitting and vice versa). This scenario passed. We did not rerun the pollutants at the lower rates since those pollutants passed at the higher rates (more conservative).

(4) The listed emission rates for NOx and CO from P101 and P103 are higher than what is presented in Table 4-1 and the emission calculation worksheets included in Appendix 1. The reason for this discrepancy is that after modeling was completed using the higher emission rates listed in Table 7-1, the emission calculations for these pollutants were revised and as a result the estimated emission rates were reduced. Since modeling completed at the higher emission rates demonstrated compliance, the original modeling was considered to be conservative and therefore modeling was not rerun.

7.3 Receptor Network

A receptor network was established so that ambient concentrations could be evaluated. The first step in this process was to determine the location of the ambient air boundary and the second step was to assign receptor locations within the ambient air zone.

7.3.1 Ambient Air Boundary

The ambient air boundary was established as the facility's fenceline. See Figure 3 – Site Map with Fenceline Location (Section 6), for location of the fenceline.

7.3.2 Receptors

Receptors were established to determine maximum ambient air concentrations. A receptor grid with approximately 100 meter spacing was established across the entire evaluated area. Within 300 meters of the ambient air boundary, receptors were established every 25 meters. Along the facility's fenceline, receptors were established every 10 meters. No receptors were established within the facility's controlled property boundary (ambient air boundary).

7.4 Elevation Data

Topography data for the site was obtained from the USGS as a 7.5 minute digital elevation model (DEM). AERMAP was used to pre-process this data for use in AERMOD.

7.5 Meteorological Data

Preprocessed meteorological data (surface and upper air) from the Boise airport was provided by the IDEQ. This data was processed by IDEQ using AERMET; the output files provided by the IDEQ were used as inputs to the AERMOD model for this site. Because this input data may not be representative of actual surface characteristics or meteorological conditions at the proposed plant location, an adjustment factor of twenty percent (20%) was applied to model results prior to adding in background concentrations.

7.6 Land Use Classification

The facility is industrial while the surrounding land is a mix of open space/agricultural and industrial land uses. The Air dispersion modeling was performed using a "rural" classification.

7.7 Surface Characteristics

Surface characteristics of the meteorological monitoring station were evaluated and incorporated into the AERMET processing performed by the IDEQ. These surface characteristics may not be representative for the IMP site but a safety factor of 20 percent was applied to model results to accommodate for the difference in surface and meteorological characteristics (as discussed in Section 7.5).

7.8 Background Concentrations

Table 7-2 summarizes the criteria pollutant background concentrations. Criteria pollutant background concentrations for small town/suburban areas were provided by Darrin Mehr of the IDEQ.

7.9 Evaluation of Compliance With Standards

As discussed in Section 7.5, a model output adjustment factor of 20% was applied to the modeling results to account for variations in surface characteristics between the meteorological monitoring station and the IMP site. To determine compliance with NAAQS, the applicable background concentrations were added to the adjusted maximum predicted ambient concentrations determined from air dispersion modeling to result in total ambient concentrations. These total ambient air concentrations were compared to the NAAQS. Table 7-2 summarizes the air dispersion modeling results and compares the total predicted ambient air concentration to the applicable NAAQS. See Appendix 4 for graphical output from air dispersion modeling. Based on this evaluation, no NAAQS are predicted to be exceeded by emissions from the sources, if operated and configured as proposed in this application.

Table 7-2
Results of Ambient Impact Assessment for Criteria Pollutants
(All Concentrations in Units of μg/m^3)

Pollutant	Averaging Period	Maximum Air Dispersion Model Output	Output Adjustment Factor	Adjusted Output	Compliance Demonstration		
					Background	Total	NAAQS
PM10	24 hr, 2nd high	52.42	1.2	63	81	144	150
	Annual	15.55	1.2	19	27	46	50
NOx	Annual	18.21	1.2	22	17	39	100
CO	1hr, 2nd high	407.3	1.2	489	3,600	4,089	40,000
	8hr, 2nd high	164.2	1.2	197	2,300	2,497	10,000

7.10 Evaluation of Ambient Impact Assessment for TAPs

The maximum model output values were adjusted using a factor of 1.2 and then compared to Acceptable Ambient Concentration for Carcinogens (AACC) values for each TAP. Table 7-3 summarizes the results of air dispersion modeling performed to evaluate the ambient impact for TAPs. None of the AACC were exceeded by any of the adjusted maximum predicted ambient air concentrations; therefore, the predicted ambient impact from TAP emissions is acceptable.

Table 7-3
Results of Ambient Impact Assessment for Toxic Air Pollutants
(All Concentrations in Units of $\mu g/m^3$)

Pollutant	Averaging Period	Maximum Air Dispersion Model Output	Output Adjustment Factor	Adjusted Output	Idaho AACC
Arsenic	Annual, 1st high	3.0E-5	1.2	3.6E-5	2.3E-4
Cadmium	Annual, 1st high	1.8E-4	1.2	2.2E-4	5.6E-4
Formaldehyde	Annual, 1st high	1.2E-2	1.2	1.4E-2	7.7E-2
Nickel	Annual, 1st high	3.3E-4	1.2	4.0E-4	4.2E-3